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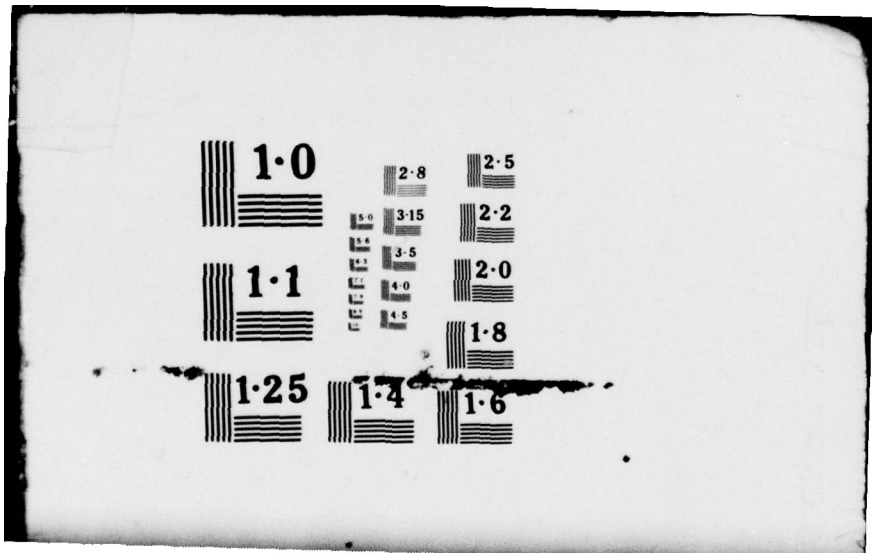
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(6) MBU-13P (C/B) PROTECTIVE MASK COMMUNICATION INTERFACE DEVICE FOR ATC FACILITIES

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The protective mask Communication Interface Device (CID) enables Air Traffic Controllers to operate ground to air transmitters in the control towers and provides intercom capability while the operators are required to wear the protective masks.

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ABSTRACT

The MBU-13P (C/B) Protective Mask Communications Interface Device (CID) allows Air Traffic Controllers to operate ground-to-air transmitters in the control towers and provides intercom capability while the operators are required to wear the protective masks.

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1.0 BACKGROUND.

1.1 This technical report concerns a study accomplished by the 1842 EEG pertaining to the feasibility of modifying the MBU-13P (C/B) Protective Mask to the extent that Air Traffic Controllers would have the ability to operate ground-to-air transmitters, as well as intercom equipment, while wearing the protective mask.

1.2 Prior to 11 Dec 1978, a preliminary investigation using the protective mask was conducted by 1842 EEG/EEITR. At this time, it was determined that the use of Star Set electronics with the protective mask (microphone and phones) was not a satisfactory solution. Since the tower console input and output impedances did not match the electronic components of the protective mask, it was apparent that extensive modifications to both the console and the protective mask would be necessary to satisfy the requirements. However, this action would require extensive modification action through AFLC channels and at best would require 36 to 48 months procurement time.

1.3 The 1842 EEG/EEITR then investigated alternatives that would solve or alleviate most of the operational problems. The investigation indicated that no commercial device existed that would provide the interface required to enable operation of the protective mask with the console. It was therefore decided to design and test a prototype interface device that would satisfy the requirement without having to modify either the console or the protective mask.

2.0 INTERFACE DEVICE.

2.1 Requirements.

2.1.1 Tower controllers rely heavily on verbal coordination between their positions in the tower. This coordination is not normally conducted over the headset. When a controller is wearing a protective mask he is in a world of his own. When verbal communication with his fellow controller is required, some type of intercom is mandatory.

2.1.2 The following interface capabilities were developed to satisfy the protected mission requirements:

a. Intercom between 3 positions (3 controllers wearing protective masks) on a non-interfering basis.

b. Each operator/controller must be able to access an operational channel while the other two are using the intercom.

c. Each operator must be able to monitor a selected receiver as is normally accomplished on phones.

d. When in the intercom position, each operator must be able to hear paging speakers in the room.

e. Each operator must be able to monitor a selected receiver in either the INTERCOM or the TRANSMIT mode.

f. When in the TRANSMIT mode, the audio in the INTERCOM mode must not be permitted to modulate the selected channel on transmit.

2.2 Description and Function.

2.2.1 Figure 1 shows a block diagram of the interface device with the following capabilities:

a. When the unit is plugged into the control console position and the AC power, each operator may select an operational channel on the console. When the rocker switch on the mask cable is in the transmit position the operator utilizes the (PTT) push to talk button to transmit. When the rocker switch is in the intercom position the operator utilizes the PTT button to talk on the intercom to the other operators.

b. When the rocker switch is in the transmit position and a receiver is selected on the console, the operator can monitor that receiver and control the volume gain by the phone control on the console.

c. When the rocker switch is in the intercom position the operator hears any other operators intercom conversation plus the audio from the room amplifier. If the operator selects a receive channel on the console he will hear it in the intercom position as well as the intercom conversations. For private monitoring of the receive channel the operator should change the rocker switch to the other position.

d. When the operator pushes his PTT button in either of the rocker switch positions he mutes his own earphones but not the other operators. This absence of sidetone is necessary due to the mask phone and microphone characteristics to prevent feedback. Therefore, no significant sidetone is provided.

e. In all operators positions, the receive audio level is controlled as normal, using the phone console control as necessary. Intercom volume is internally set at a fixed level as is the room listening amplifier.

f. No AC switch is provided; the unit is ON when plugged in.

2.2.2 The circuits utilized in the interface device are shown in Figure 2, schematic of the mask amplifier, three required; Figure 3, schematic of hand held control switch box, three required; and Figure 4, schematic of the room amplifier and power supply, one required. All circuits use solid state integrated circuits (IC's).

2.2.3 Figure 2 (mask amplifier) is comprized of one LM381 IC, Dual Operational Amplifier; one C4016, CMOS, Quad, Bi-Lateral Solid State Switch; and one LM380N-8, 8 PIN DIP Operational Power Amplifier. The low level signal from the mask microphone is fed to the matching transformer T1 and then to half of the LM381, which is designated LM381"A". The LM381"A" is used as a high gain preamplifier. The amplified audio is fed out of pin 7 to pin 1 and 3 of the C4016. If the operator has his Rocker Mode Switch in the TRANSMIT position, PTT SW "C" will turn on when the PTT button is depressed. This allows the audio out of pin #2 of C4016 to be coupled to LM381"B" where it is further amplified and then fed to T2 transformer to the transmit line via the console channel selector. When the operator pushes his PTT button, SW "C" also operates the mute section of the C4016 via the steering diode D1 muting the input to the earphone amplifier LM380N-8. This prevents feedback from the earphones to the microphone during transmission. Upon release of the PTT button, the earphone amplifier is unmuted and the operator will hear the selected receiver audio in his earphones.

Volume level is controlled by the phones control on the console. If the Rocker Mode Switch is in the INTERCOM position, SW"C" is opened and SW "A" is "ON". When the operator depresses the PTT button, he turns SW "B" on and at the same time mutes the earphone amplifier through D2 and the mute section of C4016. The amplified audio from the LM 381"A" preamp is fed through SW "B" pins 3 and 4 to the (IC) intercom buss through a 10K ohm resistor. This audio then goes to the other mask amplifiers via the intercom buss and is heard by the other two operators, but not by the originator because his earphone amplifier is muted during his PTT time. When the operator releases his PTT button, SW "B" opens, as does the mute section of C4016; therefore, any audio from the other operators that is present on the intercom buss, plus the room amplifiers, will be heard via the SW "A" which is on providing the audio to the LM380N-8 earphone amplifier which is unmuted. Therefore, complete intercom capability is provided.

2.2.4 Figure 3 schematic shows the circuit which enables or disables the CM0S, C4016 switch sections SW "C", SW "B" and SW "A" in Figure 2. Figure 4 is the schematic of the overall power supply which provides 12 VDC for all amplifiers and switches. It also contains one-half of an LM381 IC, which is exactly like the other microphone preamps; i.e., its output is fed continuously to the intercom buss, the microphone in the enclosure listens to the room paging speakers, etc.

2.2.5 The TX output line level is equal to the output of the original carbon microphone headset; i.e., approx -17DBM to -10DBM. The intercom level is set internally in the earphone amplifier for a comfortable intercom level. The receiver level is controlled by the console phone control preceeding the earphone amplifier.

2.2.6 The interface device as described provides the capability required in operating the console with the following necessary exceptions. No significant side-tone is provided in the intercom or transmit modes of operation and when attempting to communicate over the hot-line with the mask, it is necessary (because the loudspeaker cannot be heard through the mask) to lift one earphone. This is because the mask must be in the transmit mode to enable talking on the hot-line. When in the transmit mode, the room microphone/amplifier is not connected, therefore, no audio reaches the mask earphones from the hot-line speaker via the room microphone.

3.0 CONCLUSIONS.

3.1 The interface device (as designed for special contingency utilization) is considered adaptable for Air Force wide use wherever six-wire console control headsets are used and the MBU-13P (C/B) Chemical Biological Protective Mask is required.

3.2 Any significant comments that may develop as a result of FFN field testing should be referred to the author for possible supplemental inclusion in this tech report.

3.3 Acquisition of this interface device in quantity requires a definitive follow-on specification for procurement or development of Standards for in-house fabrication by AFCS.

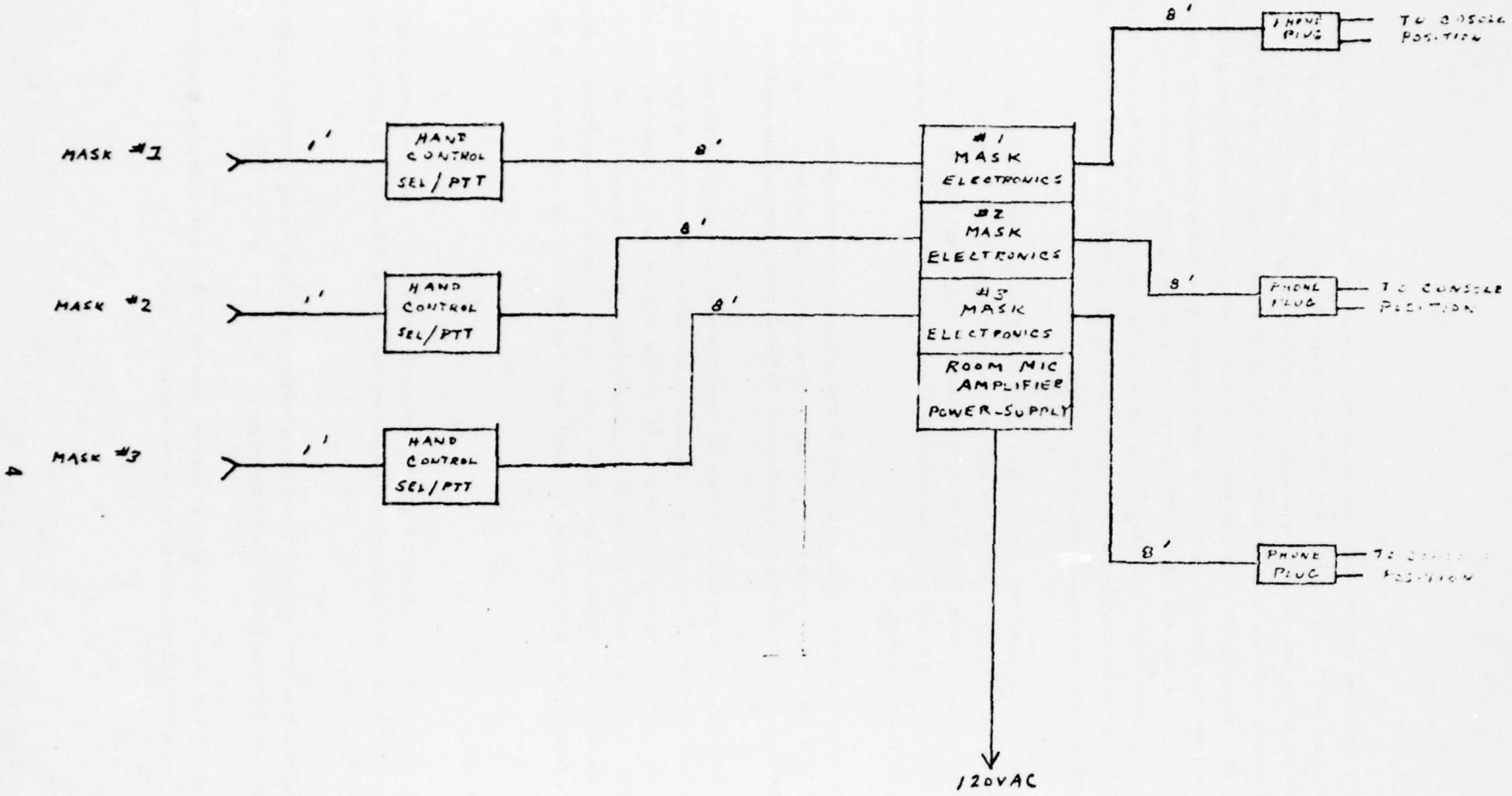

Figure 1. Interface Device Block Diagram

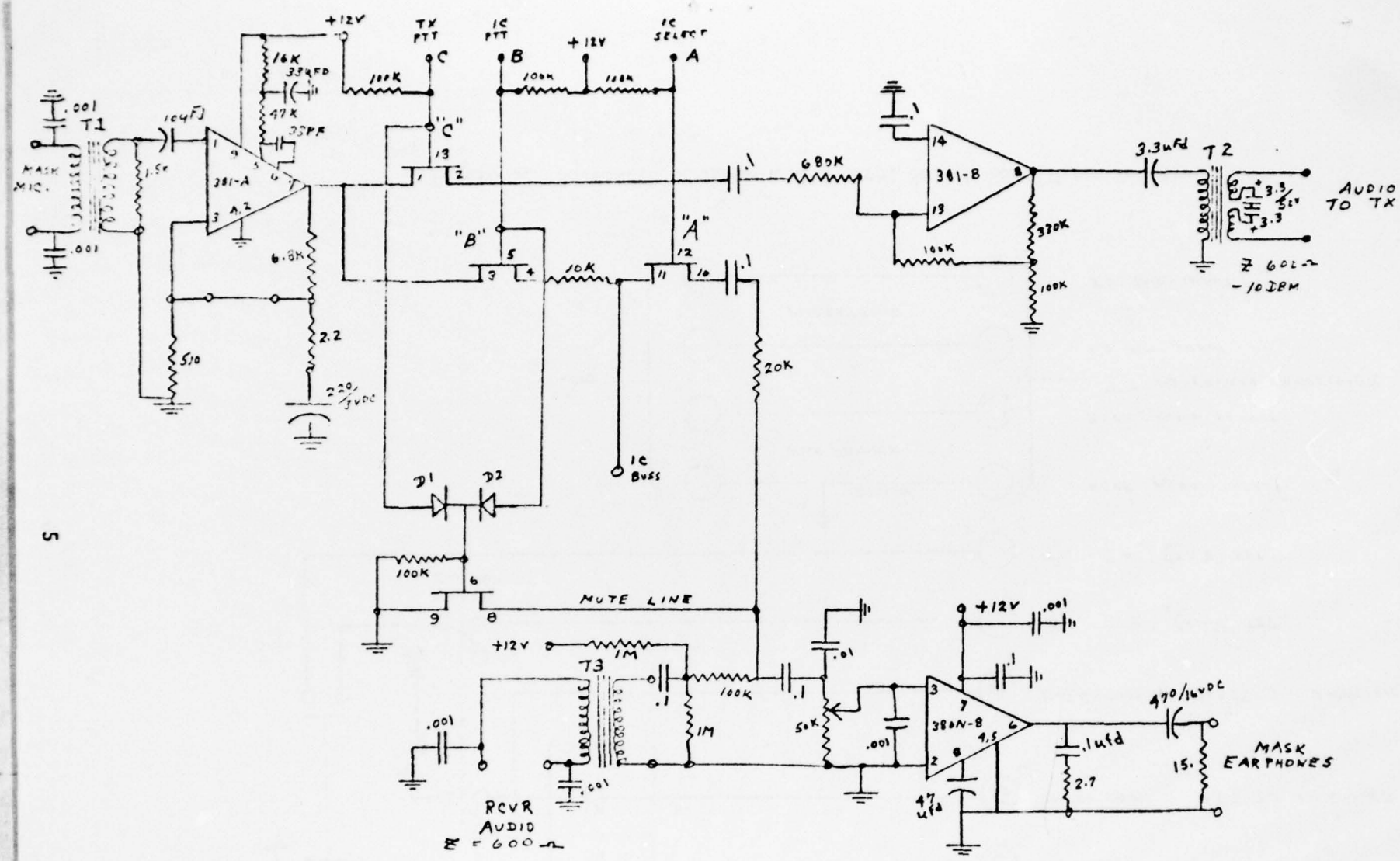

Figure 2. MBU-13P Mask Interface Schematic Amplifier (Two Required)

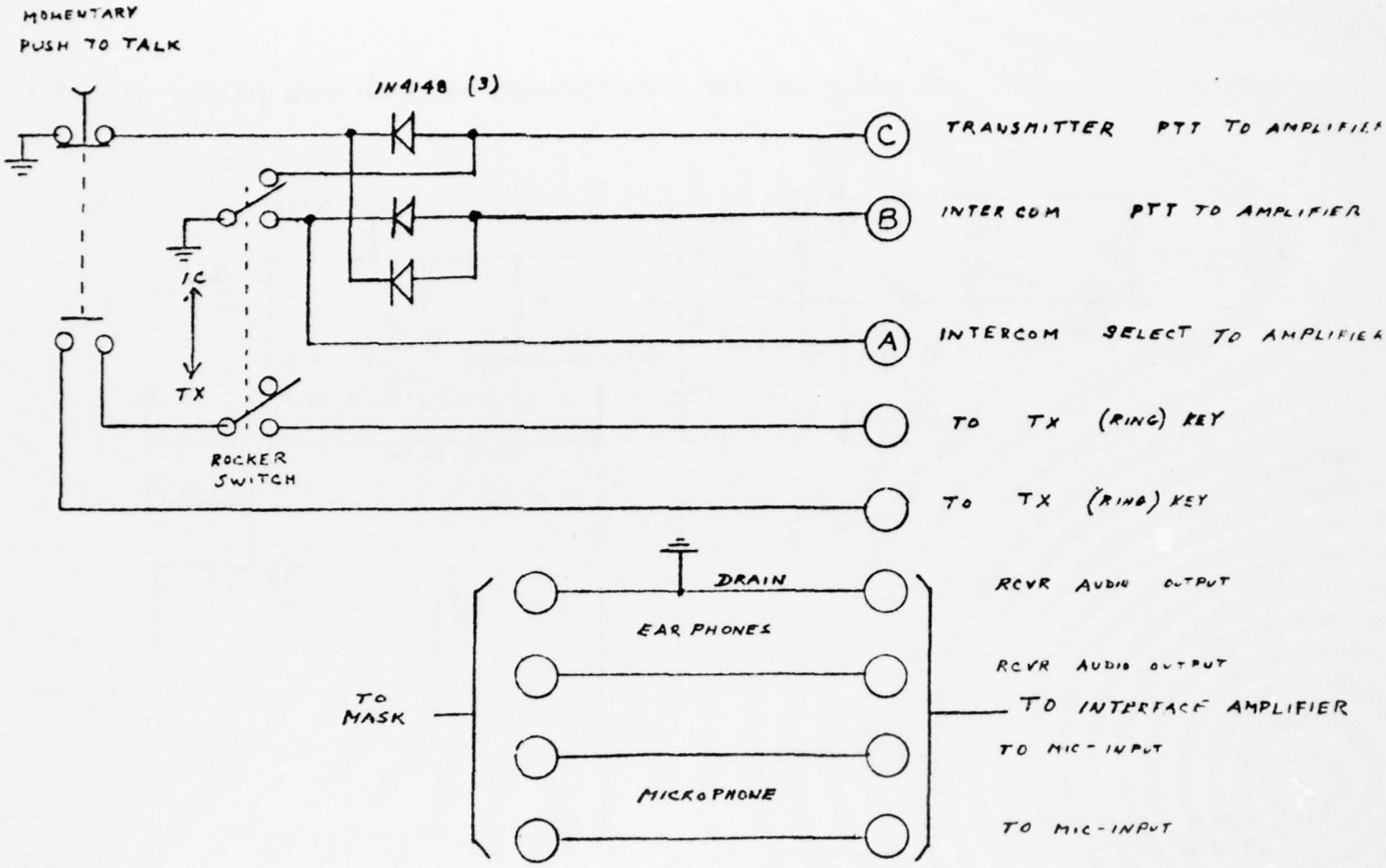

Figure 3. Schematic of Hand-Held Control Switch Box (Three Required)

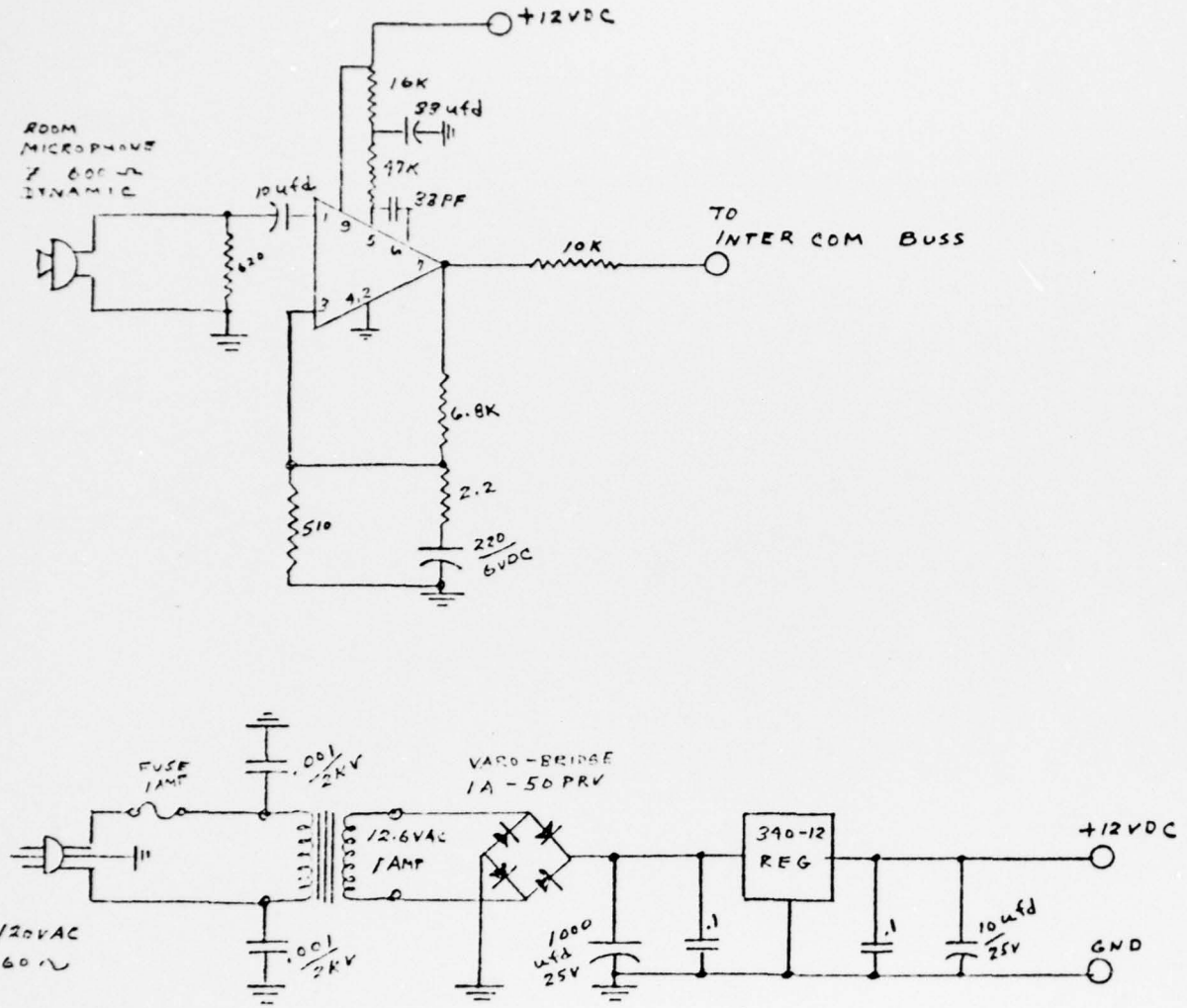

Figure 4. Room Amplifier/Power Supply Schematic (One Required)

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